CPP

SETS & RELATIONS : SHEET - 4

Problems involving Definition of relation, No. of relations, Roaster & Set builder forms, Types of Relations

LEVEL-1

Q.1 Let A = {1, 2, 3}. The total number of distinct relations that can be defined over A is
(A) 2^9 (B) 6 (C) 8 (D) None of these

Q.2 If R is a relation from a finite set A having m elements to a finite set B having n elements, then the number of relations from A to B is-
(A) 2^{mn} (B) $2^{mn} - 1$ (C) 2mn (D) m^n

Q.3 Let X = {1, 2, 3, 4, 5} and Y = {1, 3, 5, 7, 9}. Which of the following is/are relations from X to Y -
(A) $R_1 = \{(x, y) \mid y = 2 + x, x \in X, y \in Y\}$
(B) $R_2 = \{(1, 1), (2, 1), (3, 3), (4, 3), (5, 5)\}$
(C) $R_3 = \{(1, 1), (1, 3), (3, 5), (3, 7), (5, 7)\}$
(D) $R_4 = \{(1, 3), (2, 5), (2, 4), (7, 9)\}$

Q.4 A relation from P to Q
(A) A universal set of P × Q (B) P × Q
(C) An equivalent set of P × Q (D) A subset of P × Q

Q.5 The relation R defined on the set A = {1, 2, 3, 4, 5} by $R = \{(x, y) : |x^2 - y^2| < 16\}$ is given by
(A) {(1, 1), (2, 1), (3, 1), (4, 1), (2, 3)} (B) {(2, 2), (3, 2), (4, 2), (2, 4)}
(C) {(3, 3), (3, 4), (5, 4), (4, 3), (3, 1)} (D) None of these

Q.6 If A = {1, 2, 3}, B = {1, 4, 6, 9} and R is a relation from A to B defined by 'x is greater than y'. The range of R is -
(A) {1, 4, 6, 9} (B) {4, 6, 9} (C) {1} (D) None of these

Q.7 Let R be a relation in N defined by $R = \{(1+x, 1+x^2) : x \le 5, x \in N\}$. Which of the following is false -
(A) R = {(2, 2), (3, 5), (4, 10), (5, 17), (6, 25)}
(B) Domain of R = {2, 3, 4, 5, 6}
(C) Range of R = {2, 5, 10, 17, 26}
(D) R = {(2, 2), (3, 5), (4, 10), (5, 17), (6, 26)}

LEVEL-2

Q.1 The relation R defined in A = {1, 2, 3} by aRb if $|a^2 - b^2| \le 5$. Which of the following is false?
(A) R = {(1, 1), (2, 2), (3, 3), (2, 1), (1, 2), (2, 3), (3, 2)}
(B) Range of R = {1, 2, 3}
(C) Domain of R = {1, 2, 3}
(D) Range of R = {5}

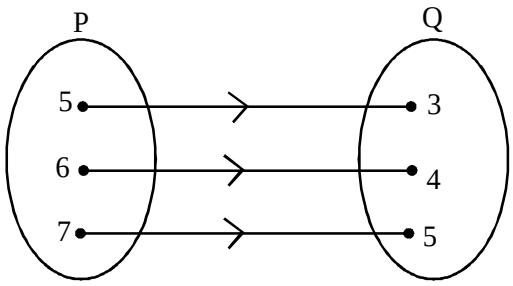
Q.2 A relation R is defined from {2, 3, 4, 5} to {3, 6, 7, 10} by xRy ⇔ x is relatively prime to y. Then domain of R is
(A) {2, 3, 5} (B) {3, 5} (C) {2, 3, 4} (D) {2, 3, 4, 5}

Q.3 Let $A=\{1,2,3,4,6\}$. Let R be the relation on A defined by $\{(a,b): a,b\in A, b$ is exactly divisible by a$\}$.

(i) Write R in roster form (ii) Find the domain of R (iii) Find the range of R

Q.4 Let R be the relation on Z defined by $R=\{(a,b), a,b\in Z, a^2=b^2\}$. Find (i) R (ii) domain of R (iii) range of R.

Q.5 The given diagram shows a relation from set P to set Q. Write this relation:



(i) in set builder form (ii) in roster form

Q.6 In the set of natural numbers, let R be the relation defined on N as a Rb if and only if a, $b\in N$ and $a+2b=11$. Write R as the set of ordered pairs. Find the domain of R and the range of R.

Q.7 A relation R is defined on the set Z of integers as follows:

$(x,y)\in R$ iff $x^2+y^2=25$

Express R as the sets of ordered pairs and hence find domain & Range.

ANSWERS - SHEET - 4

LEVEL-1

1. A
2. A
3. A, B, C
4. D
5. D
6. C
7. A

LEVEL-2

1. D
2. D
3. (i) {(1, 1), (1, 2), (1, 3), (1, 4), (1, 6), (2, 2), (2, 4), (2, 6), (3, 3), (3, 6), (4, 4), (6, 6)}
   (ii) {1, 2, 3, 4, 6} (iii) {1, 2, 3, 4, 6}
4. (i) $R=\{(a,a): a\in Z\}\cup\{(a,-a), a\in Z\}$
   (ii) Z (iii) Z
5. (i) $R=\{(x,y): x=y+2, x\in P, y\in Q\}$, where $P=\{5,6,7\}, Q=\{3,4,5\}$
   (ii) $R=\{(5,3),(6,4),(7,5)\}$
6. Domain of R = {9, 7, 5, 3, 1}, range of R = {1, 2, 3, 4, 5}
7. R = {(0, 5), (0, –5), (3, 4), (3, –4), (–3, 4), (–3, –4), (4, 3)(4, –3), (–4, 3), (–4, –3), (5, 0), (–5, 0)}
   Domain of R = {0, –3, 3, –4, 4, 5, –5}
   Range of R = {0, –3, 3, –4, 4, 5, –5}